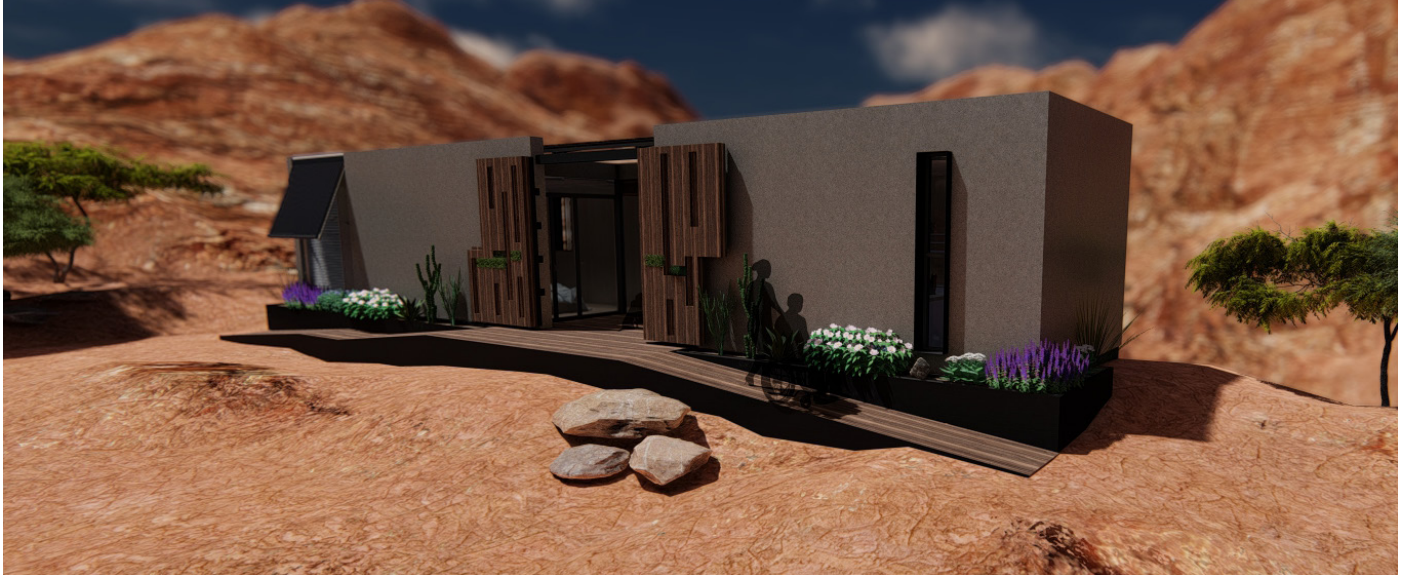


## Team Las Vegas

### Financial Affordability & Feasibility



### Contents

Affordability.....	2
Cost-Effectiveness.....	4
Cost Estimate.....	6
Reference.....	8
Appendices.....	9

#### Primary Faculty Contact:

Eric Weber

University of Nevada, Las Vegas

School of Architecture

4505 S. Maryland Parkway

Las Vegas, NV 89154

[eric.weber@unlv.edu](mailto:eric.weber@unlv.edu)

#### Primary Student Contact:

Ryan Manthei

University of Nevada, Las Vegas

School of Architecture

4505 S. Maryland Parkway

Las Vegas, NV 89154

[mantheir@unlv.nevada.edu](mailto:mantheir@unlv.nevada.edu)



U.S. DEPARTMENT OF ENERGY

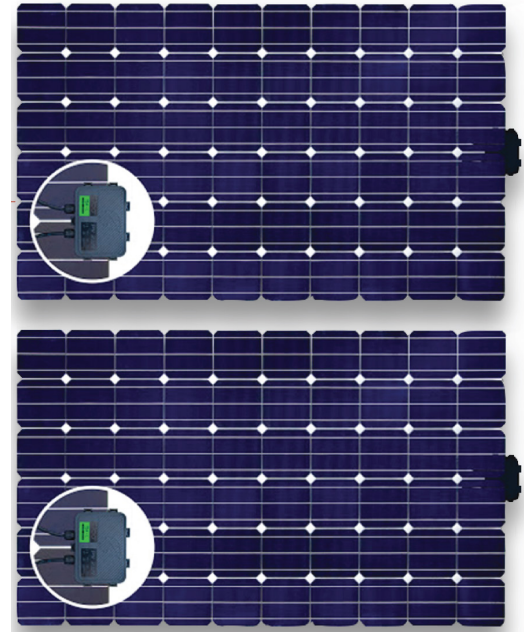
SOLAR DECATHLON

UNLV

## Affordability

Mojave Bloom is very likely to be an ideal fit for returning veterans. We have reduced overall sizing without sacrificing comfort or effectiveness. We believe we have established dynamic modularity, avoiding waste but maintaining a beautiful design. We have also taken many efforts to bring down utility costs to make the house more affordable to veterans. We have incorporated a structural system that makes construction more efficient.

Mojave Bloom is equipped with sixteen Sunprime HxB 400 Bifacial Panels and phase changing HVAC material with encapsulated eutectic salts which allows the temperature to stay stable throughout the year. Inside, mini-split heat pumps that ensure the house will always remain at optimal temperature with reduced heating and cooling loads, its cross-ventilation design allows for less



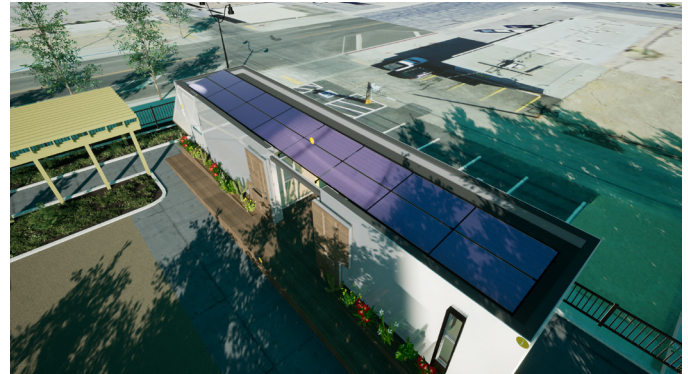
DUOMAX Twin Bifacial Dual Glass 72 Cell Module

fan and electricity use as well. All landscape and interior plant features are drought tolerant varieties that will boost appeal but cut watering costs dramatically. The home incorporates home automation via smart phone access to manage everything from temperature to yard irrigation.

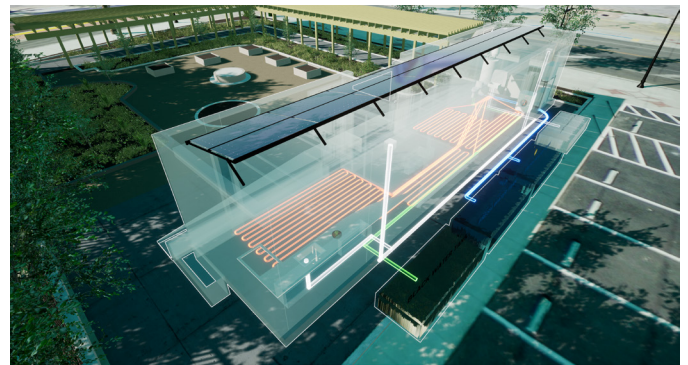
## Affordability (Continued)

In the Southwest Region, the dramatic sunlight and strong south winds are resources our beautiful desert provides, which we can utilize for a more efficient and affordable design.

We reside in a landscape that requires attention to sun and water. We have taken full advantage our sunny environment by using PV Bifacial Panels, which shade our outdoor spaces, allowing activity in outdoor spaces that would otherwise be too uncomfortable on hot summer days. We are also incorporating greywater reuse, which is another essential resource in our dry climate.



DUOMAX Twin Bifacial Dual Glass 72 Cell Module



3D Rendering of the rainwater and greywater reuse

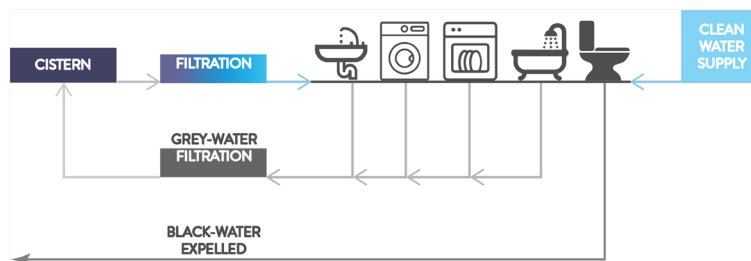
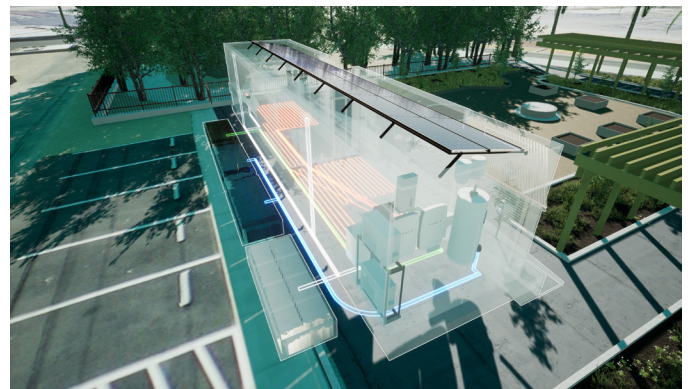


Diagram of the graywater and rainwater reuse



## Cost-Effectiveness

**Does the house offer a good value to the target market, considering quality of design, construction, materials, equipment, and other related elements?**

Overall, the market could easily benefit from a more energy efficient, modular design that can be easily transported to any Mojave Desert neighborhood. With its embrace of outdoor activity, we can envision interactive community streets with immersive outdoor features that can easily accommodate private space without giving up a sense of community. The design is attentive to the inhabitant, and its landscape materials blend into our desert environment, while reducing the typical maintenance required to maintain other materials in the harsh sun. The design is more compact, more dynamic, and more cost effective for the target market.

**To what extent is the cost-effectiveness supported by reasonable and complete market analysis?**

The market potential of Desert Bloom data obtained from the Lied Institute for Real Estate Studies at UNLV tell us that within a one-mile radius of our proposed site the median household income is \$21,170, less than half of the region's median of \$58,432. The median home value is \$118,000, with 70% valued under \$150,000. This is consistent with the fact that the majority of housing in the area is significantly older than average. The significance in this area is the ten percent of the local population that has served in the U.S. military, primarily from Vietnam to the Gulf War era. Forty percent of households are below the poverty level, with thirty-six percent disabled. These numbers strongly indicate the need for affordable

## Cost-Effectiveness (Continued)

housing for our veteran population, with 36% paying more than 50% of their income in rent, and eleven percent of households paying more than 50% of their income on mortgages. One statistic Desert Bloom can directly address is the average cost of electricity in Las Vegas equals \$1620-2160/year. With the high number of households paying such a large percentage of their income in rent or mortgages, eliminating the cost of utilities can have a significant impact on monthly spending. Considering the above characteristics of the target occupants, the team worked tirelessly to create an exquisitely crafted home that includes all the conveniences of conventional homes. Team Las Vegas has used the appropriate increment of complexity and life cycle cost when addressing design issues and it is anticipated that the majority of

systems will employ readily available components, typical construction methods, and rational assumptions for power production.

Ensuring high-efficiency operation, selecting reliable products and sizing the right capacity of the systems are the goals of the team; not just to reduce the cost of construction. Although plenty of exotic technology and products are currently on the market, fixtures, equipment and systems will be carefully selected for a balance between performance and cost.

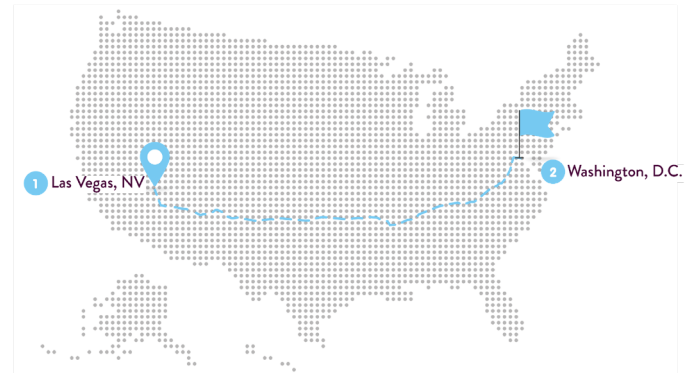
## Cost Estimate

### How successfully does the team construction cost estimate reflect the as-built competition house?

The construction cost estimate is \$440,430 as of today. However, looking through our documents, we realized there were many factors that influenced this number such as:

- the furniture counted as built in, instead of as FEE (separate budget)
- the wall and door protections
- the window treatments (motorized)
- transportation fee to transport the house to Washington D.C.
- \$21,366 was spent for steel frames because this house was designed to be part of the National Showcase Houses that was supposed to be held at Washington D.C. The house needed to be able to withstand being transported from Las Vegas to Washington D.C. which is

around 2,400 miles away.



Visual map of the distance to transport the building.



**The quality and magnitude of the team operational cost estimate for the as-built competition house, including forecasted utility, maintenance, insurance, and any monthly operations or subscription fees.**

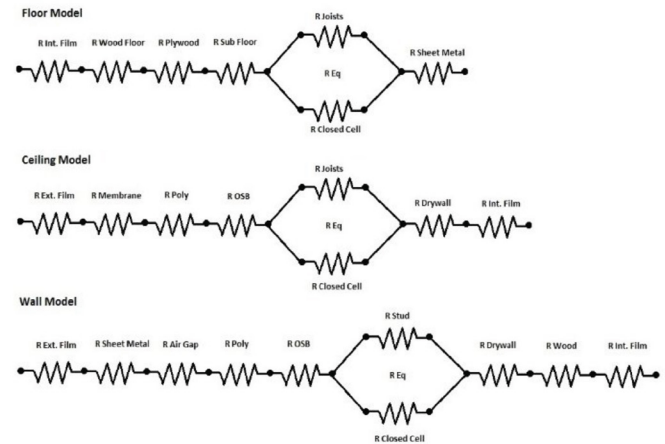
Utilities: \$8,912 yearly

Insurance: \$3,260/ year

Subscription fees: internet is around \$70/ month

## Cost Estimate (Continued)

With current design parameters, BEopt, an energy modeling software, outputs a Home Energy Rating System (HERS) score of 30.2, indicating the design consumes 30.2% of energy comparable to a conventional, code-built home. Annual energy consumption is 4,123 kWh after calculating the usage and power consumption of devices that use electricity. This is only a third of the annual energy production at 12,071 kWh with the help of the photovoltaic system, according to System Advisory Model (SAM) software. R-values were calculated similar to the method of how equivalent resistance of an electrical circuit is calculated, as depicted above. Floor R-Value is 56, Roof R-Value is 71, and Wall R-Value is 42.



Resistance Analogy:

## Reference

Design Document Cost Estimate  
Lied Institute for Real Estate Studies at UNLV



## Appendix B



### UNLV Solar Decathlon 2020

*Las Vegas, NV*

UNLV, School of Architecture

**DESIGN DOCUMENT COST ESTIMATE**

OCMI JOB #: 19LIBR02.000

04 November 2019



U.S. DEPARTMENT OF ENERGY

**SOLAR DECATHLON**

**UNLV**

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

### COST ESTIMATE

#### INTRODUCTORY NOTES

This estimate is based on verbal direction from the client and the following items, received 06 October 2019:

**Mojave Bloom Full Set\_20191006** G-001 thru T-602 (62 sheets)

The following items are excluded from this estimate:

- Professional fees.
- Building permits and fees.
- Inspections and tests.
- Furniture, fixtures & equipment, except as noted.
- Installation of owner furnished equipment.
- Construction change order contingency.
- Overtime.
- Hazardous material abatement/removal.
- Items referenced as NOT INCLUDED or NIC in estimate.

The midpoint of construction of January 2020 is based on:

- Construction start date of November 2019
- Estimated construction duration of 05 months
- This estimate is based on a Design-Bid-Build delivery method.
- This estimate is based on open shop labor rates.
- This estimate is based on a detailed measurement of quantities. We have made allowances for items that were not clearly defined in the drawings. The client should verify these allowances.
- This estimate is based on a minimum of four competitive bids and a stable bidding market.
- This estimate should be updated if more definitive information becomes available, or if there is any change in scope.
- We strongly advise the client to review this estimate in detail. If any interpretations in this estimate appear to differ from those intended by the design documents, they should be addressed immediately.

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

## PROJECT SUMMARY

ELEMENT	TOTAL COST	GFA	\$/SF AREA
01. BUILDING	\$413,231	750	\$550.97
02. ON-SITE IMPROVEMENTS	\$29,193	495	\$58.98
TOTAL CONSTRUCTION COST		\$442,424	

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

## DETAILED PROJECT SUMMARY

ELEMENT		TOTAL COST	GFA	\$/SF AREA
01. BUILDING		\$336,289	750	\$448.39
02. ON-SITE IMPROVEMENTS		\$22,135	495	\$44.72
TOTAL NET DIRECT COST		\$358,424		
GENERAL MARKUPS				
DESIGN CONTINGENCY	7.50%	\$26,882		
ESCALATION TO MIDPOINT 01/2020	1.33%	\$5,137		
GENERAL CONDITIONS/REQUIREMENTS	8.00%	\$31,235		
CONTRACTOR OVERHEAD AND PROFIT	3.00%	\$12,650		
INSURANCE	0.80%	\$3,475		
BONDS: CONTRACTOR	0.60%	\$2,627		
TOTAL CONSTRUCTION COST		\$440,430		



## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

## BUILDING SUMMARY

ELEMENT		TOTAL COST	\$/SF AREA
01 GENERAL REQUIREMENTS			
02 EXISTING CONDITIONS			
03 CONCRETE		\$5,810	\$7.75
04 MASONRY			
05 METALS		\$25,681	\$34.24
06 WOOD, PLASTICS, AND COMPOSITES		\$30,348	\$40.46
07 THERMAL AND MOISTURE PROTECTION		\$46,443	\$61.92
08 OPENINGS		\$25,887	\$34.52
09 FINISHES		\$31,775	\$42.37
10 SPECIALTIES		\$1,368	\$1.82
11 EQUIPMENT		\$1,934	\$2.58
12 FURNISHINGS		\$592	\$0.79
13 SPECIAL CONSTRUCTION		\$2,667	\$3.56
14 CONVEYING EQUIPMENT			
21 FIRE SUPPRESSION		\$3,190	\$4.25
22 PLUMBING		\$15,902	\$21.20
23 HEATING, VENTILATING, AND AIR CONDITIONING		\$46,899	\$62.53
26 ELECTRICAL		\$92,587	\$123.45
27 COMMUNICATIONS		\$2,581	\$3.44
28 ELECTRONIC SAFETY AND SECURITY		\$2,625	\$3.50
31 EARTHWORK			
32 EXTERIOR IMPROVEMENTS			
33 UTILITIES			
NET DIRECT BUILDING COST		\$336,289	\$448.39
DESIGN CONTINGENCY	7.50%	\$25,222	\$33.63
SUBTOTAL		\$361,511	\$482.01
ESCALATION TO MIDPOINT 01/2020	1.33%	\$4,820	\$6.43
SUBTOTAL		\$366,331	\$488.44
GENERAL CONDITIONS/REQUIREMENTS	8.00%	\$29,306	\$39.08
SUBTOTAL		\$395,637	\$527.52
CONTRACTOR OVERHEAD AND PROFIT	3.00%	\$11,869	\$15.83
SUBTOTAL		\$407,506	\$543.34
INSURANCE	0.80%	\$3,260	\$4.35
SUBTOTAL		\$410,766	\$547.69
BONDS: CONTRACTOR	0.60%	\$2,465	\$3.29
<b>TOTAL BUILDING COST</b>		<b>\$413,231</b>	<b>\$550.97</b>
GROSS FLOOR AREA:		750 SF	

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
<b>03 CONCRETE</b>				
Foundation System				
Pier jacks	1	LS	5,600.00	\$5,600
Bench footing, See On-site Improvement		NOTE		
Miscellaneous concrete, pad, curbs etc	1	LS	210.00	\$210
<b>TOTAL - 03 CONCRETE</b>				<b>\$5,810</b>
<b>05 METALS</b>				
Structural Steel Framing				
Structural steel	6	TON	3,530.70	\$21,366
Connections, base plates, stiffeners, etc.	12%		14,956.20	\$1,795
Miscellaneous Metals and Fabrications				
Towing tongue, Allowance	1	LS	595.00	\$595
Photovoltaic support rack	100	SF	14.00	\$1,400
Miscellaneous metals	750	SF	0.70	\$525
<b>TOTAL - 05 METALS</b>				<b>\$25,681</b>
<b>06 WOOD, PLASTICS, AND COMPOSITES</b>				
Rough Carpentry				
Wood framing				
Exterior				
Walls	1,584	SF	5.05	\$7,994
Sheathing, plywood	1,584	SF	1.25	\$1,980
Truss system including sheathing				
Floor	750	SF	7.00	\$5,250
Roof	650	SF	8.40	\$5,460
Interior				
Walls	253	SF	3.65	\$923
Sheathing, plywood	506	SF	1.25	\$633
Miscellaneous rough carpentry	750	SF	0.70	\$525
Finish Carpentry				
Casework				
Clean				
Base	6	LF	174.82	\$1,049
Countertop, plastic laminate with backsplash	6	LF	39.87	\$239
Live				

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Base	13	LF	174.82	\$2,273
Countertop, plastic laminate with backsplash	13	LF	39.87	\$518
Upper cabinetry	5	LF	126.00	\$630
Full height wall cabinet	4	LF	199.59	\$798
Sleep				
Full height wall cabinet	9	LF	199.59	\$1,796
Miscellaneous finish carpentry	1	LS	280.00	\$280
TOTAL - 06 WOOD, PLASTICS, AND COMPOSITES				\$30,348

## 07 THERMAL AND MOISTURE PROTECTION

Moisture Protection				
Vapor barrier, at exterior wall	1,584	SF	3.50	\$5,544
Thermal and Sound Insulation				
Walls				
Insulation				
Batt				
6"	1,584	SF	0.87	\$1,374
Rigid				
2-1/2"	1,584	SF	1.40	\$2,218
Wall Panels and Siding				
Galvanized siding, including attachments	1,442	SF	18.90	\$27,254
Roofing				
Single ply membrane assembly, including thermoset, slope, etc.	750	SF	6.46	\$4,845
Rigid insulation	750	SF	2.54	\$1,904
Cover board	750	SF	0.81	\$604
Miscellaneous roof elements	750	SF	0.70	\$525
Leak test	1	LS	700.00	\$700
Firestopping, Joint Sealants, Caulking				
Firestopping, joint, sealants	750	SF	0.71	\$530
Caulking				
Exterior , at exterior enclosure	750	SF	0.28	\$210
Interior, including firestopping	750	SF	0.28	\$210
Acoustical sealants				
Interior	750	SF	0.70	\$525
TOTAL - 07 THERMAL AND MOISTURE PROTECTION				\$46,443

## 08 OPENINGS

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Doors, Frames and Hardware				
Exterior				
Hollow metal including frame and hardware				
Double	1	PR	2,008.97	\$2,009
Supplementary hardware				
Miscellaneous supplementary hardware	15%		1,406.30	\$211
Specialty doors				
Sliding gate				
9' - 6" x 11' - 0"	1	EA	3,969.00	\$3,969
Motor operation	1	EA	1,493.55	\$1,494
Glass and Glazing				
Exterior				
Storefront	20	SF	52.78	\$1,056
Storefront, tempered	10	SF	59.78	\$598
Interior				
Aluminum fully glazed including frame and hardware				
Single	4	EA	2,002.82	\$8,011
Storefront, tempered	108	SF	59.78	\$6,456
Mirror				
Metal frame	1	EA	52.84	\$53
Louver				
Fixed, aluminum finish, 3' 6" x 7' 0"	1	EA	490.00	\$490
Operable, aluminum, 3' 6" x 7' 0"	1	EA	840.00	\$840
Water testing	1	LS	700.00	\$700
<b>TOTAL - 08 OPENINGS</b>				<b>\$25,887</b>

## 09 FINISHES

Framing and Wallboard				
Ceiling framing	303	SF	7.00	\$2,121
Backing, bracing, etc.	10%		1,484.70	\$148
Gypsum board				
Taped and finished	1,584	SF	1.77	\$2,802
Ceiling				
Hard lid	189	SF	2.10	\$397
Hard lid, moisture resistant	114	SF	2.24	\$255
Paint and Wall Covering				
Paint				



## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Interior				
Wall	1,584	SF	0.73	\$1,151
Ceiling	303	SF	1.08	\$326
Open structure	132	SF	1.05	\$139
Wall covering				
Tongue and groove ashwood planks	630	SF	10.50	\$6,615
Tile				
Hand fired tile				
Flooring	106	SF	12.88	\$1,365
Ceramic tile				
Wall finish	351	SF	14.12	\$4,956
Base	44	SF	14.00	\$616
Flooring				
Wood				
Tongue and groove ashwood planks	373	SF	7.21	\$2,689
Thermory plank, at connect and pass	255	SF	8.40	\$2,142
Linoleum	16	SF	3.97	\$63
Ceiling				
Translucent, tectum panel	253	SF	17.50	\$4,428
Thermory wood panel	62	SF	25.20	\$1,562

TOTAL - 09 FINISHES	\$31,775
---------------------	----------

## 10 SPECIALTIES

Toilet, and Bath Accessories, Allowance	106	SF	3.50	\$371
Wall and Door Protection				
Corner guard, Allowance	750	SF	0.32	\$236
Wall guard, Allowance	750	SF	0.32	\$236
Miscellaneous Specialties	750	SF	0.70	\$525

TOTAL - 10 SPECIALTIES	\$1,368
------------------------	---------

## 11 EQUIPMENT

Kitchen Appliances, CFCI				
Refrigerator	1	EA	1,163.11	\$1,163
Cook top	1	EA	478.80	\$479
Dishwasher	1	EA	291.90	\$292

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
-------------	----------	------	-----------	----------------

<b>TOTAL - 11 EQUIPMENT</b>				<b>\$1,934</b>
-----------------------------	--	--	--	----------------

**12 FURNISHINGS**

Moveable Furnishings, Excluded		NIC		
Window Treatments				
Mecho shades	30	SF	8.05	\$242
Motorized, premium only	1	LS	350.00	\$350

<b>TOTAL - 12 FURNISHINGS</b>				<b>\$592</b>
-------------------------------	--	--	--	--------------

**13 SPECIAL CONSTRUCTION**

Planter structure, green wall				
at pass	100	SF	10.50	\$1,050
at sliding gate	154	SF	10.50	\$1,617

<b>TOTAL - 13 SPECIAL CONSTRUCTION</b>				<b>\$2,667</b>
--	--	--	--	----------------

**21 FIRE SUPPRESSION**

Multipurpose residential fire suppression system				
Sprinkler head	7	EA	137.13	\$960
Fire water distribution pipe with fittings and, supports				
Fire riser, connect to domestic water system	1	LS	1,225.00	\$1,225
Sprinkler drops	7	EA	58.52	\$410
Miscellaneous work	1	LS	595.00	\$595

<b>TOTAL - 21 FIRE SUPPRESSION</b>				<b>\$3,190</b>
------------------------------------	--	--	--	----------------

**22 PLUMBING**

Equipment				
Water heater, included in solar thermal system				
Recirculation pump, 2.2 GPM	1	EA	303.80	\$304
Storage tank	1	EA	203.70	\$204
Miscellaneous fittings and accessories	1	LS	385.00	\$385
Fixtures including rough-in				
Water closet (ADA)	1	EA	1,619.80	\$1,620
Lavatory	1	EA	1,493.10	\$1,493
Kitchen sink	1	EA	1,439.20	\$1,439
Shower	1	EA	1,541.40	\$1,541
Miscellaneous fittings				
Floor drain with P- trap and strainer	1	EA	199.50	\$200
Hose bibb	2	EA	118.38	\$237

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Domestic water system				
Building entrance, 1-1/4"				
Main shut-off valve	1	EA	128.44	\$128
Backflow preventer	1	EA	999.12	\$999
Pressure regulator	1	EA	435.40	\$435
Trap primer with access panel	2	EA	139.30	\$279
Pipe with fittings and supports				
Below grade				
1/2"	15	LF	11.57	\$174
1-1/4"	5	LF	23.29	\$116
Trench, backfill, and remove excess spoil	2	CY	56.40	\$113
Above grade, PEX				
1/2"	105	LF	1.42	\$150
3/4"	144	LF	1.80	\$259
1-1/4"	30	LF	3.81	\$114
Above grade, hot water				
1/2"	25	LF	1.42	\$36
3/4"	136	LF	1.80	\$245
Fittings and accessories, PEX	1	LS	196.00	\$196
Insulation, fiberglass with jacket				
1/2"	25	LF	2.72	\$68
3/4"	136	LF	3.05	\$414
Sanitary waste system, ABS				
Pipe with fittings, below grade				
1-1/2"	36	LF	15.75	\$567
2"	55	LF	18.55	\$1,020
Trench, backfill, and remove excess spoil	6	CY	56.40	\$338
Pipe with fittings and supports, above grade				
1-1/2"	6	LF	19.95	\$120
Sanitary vent system, ABS				
Pipe with fittings and supports, above grade				
1-1/2"	40	LF	19.95	\$798
2"	35	LF	22.05	\$772
Vent through roof				
Up to 2-1/2"	3	EA	87.50	\$263
Miscellaneous work	1	LS	875.00	\$875
<b>TOTAL - 22 PLUMBING</b>				<b>\$15,902</b>

## 23 HEATING, VENTILATING, AND AIR CONDITIONING

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Equipment				
Split system, indoor and out door heat pump	2	EA	1,685.49	\$3,371
Exhaust fan				
EF-1, kitchen exhaust	1	EA	1,258.60	\$1,259
EF-2	1	EA	209.46	\$209
EF-3	1	EA	247.99	\$248
Phase change material plenum	1	EA	1,089.29	\$1,089
Inline duct fan	1	EA	463.34	\$463
Air humidifier	1	EA	340.41	\$340
Solar thermal system				
Control system				
Controller	1	EA	169.94	\$170
Conduit and wire	1	LS	588.00	\$588
Equipment				
Pump				
Booster pump, P-1	1	EA	2,171.26	\$2,171
Circulation pump	3	EA	428.80	\$1,286
water tank	4	EA	859.39	\$3,438
Evacuated tube collector	2	EA	1,355.73	\$2,711
Hot water storage tank	1	EA	2,512.33	\$2,512
Expansion tank	2	EA	182.26	\$365
Automatic air vent	1	EA	122.50	\$123
Shutoff valve, 1/2'	1	EA	93.46	\$93
Gate, globe or check valve, 3/4"	21	EA	53.90	\$1,132
Hose bibb	2	EA	118.38	\$237
Mixing valve	4	EA	137.18	\$549
Miscellaneous fittings and accessories	1	LS	1,533.00	\$1,533
Quick Trak radiant heat panel, including HEPEX 5/16" tube	1	LS	5,454.38	\$5,454
Hydronic heated towel warmer, 1,162 BTU/HR	2	EA	571.85	\$1,144
Radiant heating manifold, 5 branch	1	EA	318.39	\$318
Tube, HEPEX				
1/2"	40	LF	1.42	\$57
5/16", included in heat panel cost				
Air distribution system				
Ductwork, galvanized steel				
Supply/return	120	LB	10.12	\$1,214
Exhaust	70	LB	10.12	\$708
Insulation/liner	130	SF	3.81	\$495
Refrigeration piping				
Piping components and specialties	2	EA	525.00	\$1,050
Pipe, with insulation, fittings, and supports	165	LF	13.93	\$2,299
Air inlets and outlets				



## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Air vent/diffuser/louver	1	EA	578.90	\$579
Automatic temperature control				
Split unit				
Automation controller	1	EA	203.35	\$203
IR transmitter/receiver	2	EA	159.08	\$318
Modem	1	EA	108.50	\$109
Ipad2	1	EA	143.50	\$144
Insteon hub	1	EA	109.90	\$110
Amazon echo	2	EA	73.50	\$147
Communication bus	1	LS	183.75	\$184
Radiant temperature control	1	LS	1,050.00	\$1,050
Other equipment				
Exhaust fan	3	EA	1,050.00	\$3,150
Plenum units	1	LS	1,295.00	\$1,295
Air humidifier	1	EA	385.00	\$385
Balancing, by and independent contractor				
Air balance	1	LS	1,050.00	\$1,050
Commissioning including documentation, performance verification and training	1	LS	735.00	\$735
Miscellaneous work	750	SF	1.09	\$814
<b>TOTAL - 23 HEATING, VENTILATING, AND AIR CONDITIONING</b>				<b>\$46,899</b>

**26 ELECTRICAL**

Power and distribution				
Connect to existing utility service	1	LS	1,225.00	\$1,225
Meter/breaker	2	EA	2,625.00	\$5,250
Subpanel, 200 amp	1	EA	5,152.00	\$5,152
Disconnect switch				
30 amp	2	EA	553.00	\$1,106
60 amp	1	EA	665.00	\$665
200 amp	3	EA	770.00	\$2,310
Tesla powerwall	2	EA	3,346.00	\$6,692
Building feeders				
Conductor, copper wire, THW, THHN				
# 6	168	LF	1.20	\$201
# 1 / 0	188	LF	3.23	\$607
Concealed conduit, EMT				
3/4"	42	LF	5.41	\$227
2"	47	LF	10.64	\$500

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Building grounding system	1	LS	1,365.00	\$1,365
Equipment and machinery power				
HVAC equipment				
Split system	2	EA	875.00	\$1,750
Exhaust fan	3	EA	595.00	\$1,785
Plenum units	1	LS	735.00	\$735
Air humidifier	1	EA	455.00	\$455
Lighting system				
Lighting controls	1	LS	1,575.00	\$1,575
Light fixture	43	EA	262.50	\$11,288
Linear fixture, LED tape light	178	LF	25.48	\$4,535
Ceiling fan	2	EA	518.00	\$1,036
Light switch	17	EA	63.29	\$1,076
Conduit and wire	852	LF	7.43	\$6,328
Convenience power				
Receptacles				
Duplex	18	EA	77.93	\$1,403
Double duplex	3	EA	81.78	\$245
GFI	5	EA	87.42	\$437
Junction box	5	EA	36.78	\$184
Conduit and wire	650	LF	7.06	\$4,586
Photovoltaic system				
Inverter	1	EA	2,149.00	\$2,149
DC disconnect	1	LS	3,850.00	\$3,850
Optimizer	16	EA	122.50	\$1,960
Solar panel including infrastructure	1	LS	20,160.00	\$20,160
Miscellaneous work	1	LS	1,750.00	\$1,750
<b>TOTAL - 26 ELECTRICAL</b>				<b>\$92,587</b>

## 27 COMMUNICATIONS

Communications system				
Telephone and data system				
Router	1	EA	385.00	\$385
Outlets				
Telephone	2	EA	64.02	\$128
Network/router	6	EA	63.84	\$383
Conduit and wire				
Conduit up to accessible ceiling	90	LF	6.66	\$599
Cabling including terminations				

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 04 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Telephone	90	LF	1.54	\$139
Data	400	LF	1.03	\$410
Cable television system				
TV outlet	2	EA	38.67	\$77
Conduit	85	LF	5.41	\$460
TOTAL - 27 COMMUNICATIONS				\$2,581
<b>28 ELECTRONIC SAFETY AND SECURITY</b>				
Fire alarm system	750	SF	3.50	\$2,625
TOTAL - 28 ELECTRONIC SAFETY AND SECURITY				\$2,625

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 05 November 2019

## SITE SUMMARY

ELEMENT		TOTAL COST	\$/SF AREA
01 GENERAL REQUIREMENTS			
02 EXISTING CONDITIONS			
03 CONCRETE		\$6,397	\$12.92
04 MASONRY			
05 METALS		\$784	\$1.58
06 WOOD, PLASTICS, AND COMPOSITES		\$1,200	\$2.42
07 THERMAL AND MOISTURE PROTECTION		\$405	\$0.82
08 OPENINGS			
09 FINISHES			
10 SPECIALTIES			
11 EQUIPMENT			
12 FURNISHINGS			
13 SPECIAL CONSTRUCTION			
14 CONVEYING EQUIPMENT			
21 FIRE SUPPRESSION			
22 PLUMBING			
23 HEATING, VENTILATING, AND AIR CONDITIONING			
26 ELECTRICAL			
27 COMMUNICATIONS			
28 ELECTRONIC SAFETY AND SECURITY			
31 EARTHWORK			
32 EXTERIOR IMPROVEMENTS		\$4,437	\$8.96
33 UTILITIES		\$8,912	\$18.00
NET DIRECT BUILDING COST		\$22,135	\$44.72
DESIGN CONTINGENCY	8.50%	\$1,864	\$3.77
SUBTOTAL		\$23,999	\$48.48
ESCALATION TO MIDPOINT 10/2020	7.33%	\$1,745	\$3.53
SUBTOTAL		\$25,745	\$52.01
GENERAL CONDITIONS/REQUIREMENTS	7.50%	\$1,916	\$3.87
SUBTOTAL		\$27,661	\$55.88
CONTRACTOR OVERHEAD AND PROFIT	3.50%	\$961	\$1.94
SUBTOTAL		\$28,622	\$57.82
INSURANCE	1.00%	\$284	\$0.57
SUBTOTAL		\$28,906	\$58.40
BONDS: CONTRACTOR	1.00%	\$287	\$0.58
<b>TOTAL BUILDING COST</b>		<b>\$29,193</b>	<b>\$58.98</b>

GROSS FLOOR AREA: 495 SF



## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 05 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
<b>03 CONCRETE</b>				
Site Concrete				
Foundation System				
Bench footing	10	CY	545.54	\$5,455
Concrete fill at deck	80	SF	4.50	\$360
Miscellaneous concrete	1	LS	581.50	\$582
TOTAL - 03 CONCRETE				\$6,397
<b>05 METALS</b>				
Steel Joist Framing, at deck perimeter				
Angle ledger	25	LF	28.00	\$700
Connections, plates, etc.	12%		700.00	\$84
TOTAL - 05 METALS				\$784
<b>06 WOOD, PLASTICS, AND COMPOSITES</b>				
Rough Carpentry				
Wood framing				
Floor, at deck	80	SF	15.00	\$1,200
TOTAL - 06 WOOD, PLASTICS, AND COMPOSITES				\$1,200
<b>07 THERMAL AND MOISTURE PROTECTION</b>				
Moisture Protection, at bench footing	270	SF	1.50	\$405
TOTAL - 07 THERMAL AND MOISTURE PROTECTION				\$405
<b>31 EARTHWORK</b>				
Earthwork, Excluded		NIC		
TOTAL - 31 EARTHWORK				
<b>32 EXTERIOR IMPROVEMENTS</b>				
Site Improvements				
Planter Wall				
2' - 6" high	1	CY	519.53	\$513
4' - 0" high	3	CY	519.53	\$1,398
Ramp with rails, Excluded		NIC		

## DESIGN DOCUMENT COST ESTIMATE

OCMI JOB #: 19LIBR02.000 | 05 November 2019

DESCRIPTION	QUANTITY	UNIT	UNIT RATE	ESTIMATED COST
Jersey barrier, Excluded		NIC		
Landscape				
Plants	1	LS	2,000.00	\$2,000
Miscellaneous				
Soil amending	230	SF	0.37	\$84
Miscellaneous landscaping, root barriers, etc.	1	LS	200.00	\$200
Irrigation				
Plant area	230	SF	0.80	\$184
Maintenance of landscape 90 days	230	SF	0.25	\$58

<b>TOTAL - 32 EXTERIOR IMPROVEMENTS</b>	<b>\$4,437</b>
---	----------------

**33 UTILITIES**

Domestic water service				
Diaphragm tank, 2 gallons	2	EA	130.00	\$260
Boost pump	1	EA	2,590.00	\$2,590
Miscellaneous fittings and accessories	1	LS	1,950.00	\$1,950
Pipe and fittings, PEX, including trench and backfill, 1"	50	LF	5.18	\$259
Sanitary waste service				
Water tank with associated fittings and accessories	2	EA	825.00	\$1,650
Pipe and fittings, ABS, including trench and backfill, 2"	24	LF	31.37	\$753
Electrical				
Power and distribution, see Building				
Landscape controls	1	LS	1,450.00	\$1,450

<b>TOTAL - 33 UTILITIES</b>	<b>\$8,912</b>
-----------------------------	----------------